# COMIC-STYLE NUDGES FOR BEHAVIORAL CHANGE

BY

PO-SHIUN HO

THESIS

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Adviser:

Associate Professor Hari Sundaram

# ABSTRACT

The major objective of this study is to examine the persuasive effect of comic-form messages compared to plain text messages on social network. We evaluated and compared several different comic parameters to understand the comic elements that can make a comic message more persuasive. With all kinds of information in different forms around us, making a message attractive and persuasive is becoming more and more challenging. As a result, in this study, we decided to examine the effect of comic messages in persuading readers to adopt behavioral change.

The thesis first introduces a method to transfer traditional text posts on social network to comic-style posts. In the second stage, we design the experiment to examine the persuasive effect of comic posts compared to plain text posts. Finally, we extend our study to compare the effects of different comic elements in persuading, such as shading, background color, and character gestures. We conducted a survey on Amazon Mechanical Turk to evaluate our findings.

The results from our experiment show that comic-style messages when compared to plain text messages can better persuade readers to adopt behavioral change. We also proofed that different comic elements can contribute differently in persuading people. The results from our study provide fundamental basis for future study on comic and graphic persuasion. The thesis hopes to provide insights to comic generating and application in communication, thus making a contribution to improve how people communicate ideas on social network.

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# CHAPTER 1
# INTRODUCTION

In modern age where the world generates information all around us every minute, everyone has access to all sorts of information. While the abundance of information for everyone might mean more freedom and opportunity to advance ourselves or connect with each other, it also means that getting the right information is becoming harder and harder. With so much information all around us everyday, how to filter essential information becomes a question every individual needs to face. This is especially the case for information on social network because it has become a trend to scroll through social network such as Facebook or Twitter on a mobile device. Aside from the fact that mobile devices often have smaller screen compared to traditional desktop or laptop computers, users of mobile devices often have limited attention on the screen since he/she might be doing something else such as walking or eating while browsing the content. As a result, attracting user's limited attention on social network has been a critical problem throughout the years.

In this study, we present a research on the persuasiveness of comic style messages. First, we reviewed some of the previous works on persuasive technologies in 3 major fields: (1) framing and phrasing of messages, (2) comparison between text and comic, and (3) communicating through comic and graphics. Second, we discuss about the general composition of a comic panel and its comparison with plain text. With the knowledge of the relationship between comic panel and plain text, we propose a method to automatically generate comic elements based on tags from text messages. Finally, in order to examine our hypothesis that comic messages are more persuasive than text messages, we designed 2 user studies. The first user study focuses on comparing the persuasiveness of comic messages with text messages, while the second user study focuses more on comparing the persuasiveness of different comic parameters.

The goal of this study is to examine if comic can be a better form of message compared to plain text and to identify the parameters within a comic that has the most effect on persuading behavioral change. Previous works have proofed that comic and graphic form messages are more attractive and more engaging for the readers. Our work extends on previous research to discuss

not only whether comic messages can attract reader's attention, but also whether comic messages can actually motivate readers to take action. This work is among the first to examine the effect on reader's behavior for comic form messages.

In this study, we developed a system that is capable of automatically generating comic components from plain text messages. It works by first processing the text message to retrieve tags in different fields such as time frame, character action, and the intensity level of action. Next, we use the tags to retrieve suitable comic elements from a template library. We then use the chosen comic elements to build our final comic panel. We presented this system to make text-to-comic transform easier and universalize the effect of comic on social network.

In the remainder of this thesis, we will describe each of the components of our system and user studies in more details. The next chapter starts with an overview of previous works on persuasive messages and how they relate to our work.

# CHAPTER 2
# RELATED WORK

Research on making messages more persuasive has been increasingly dominant due to the fact of information explosion. We live in an era where we take in information from all kinds of media every day. How to make individual message stand out among others, attract attention from readers and persuade behavioral change becomes an important problem. A lot of research has worked on techniques that can make a message more persuasive. Some focused on the framing of messages, some focused on the context of the message, while others focused on more graphic and visual aspect of message to make the message more attractive to readers. We build our research of using visual comics to attract reader attention on the previous work from all 3 focus. In the following sections, we will introduce some of the related studies categorized into 3 groups: (1) framing and phrasing of messages, (2) comparison between text and comic, and (3) communicating through comic and graphics.

## 2.1 Message Framing & Phrasing

Approaches to make a message more attractive and persuasive has long been a focus for a variety of different fields including computational linguistic, social networking, and advertising. Among these techniques, message framing and phrasing is one of the most basic and intuitive methods to generate memorable and persuasive messages. This is mainly because message framing and phrasing generally doesn't require additional information or data visualization. Its simplicity contributes to the various researches on the effect of message framing in memorability. In [1], the study showed that using unusual word choices and more general theme makes it easier to connect with reader's daily life and makes the message more memorable. Through the use of unexpected words and phrases, the message is more likely to capture reader's attention compared text using normal phrases. As for the theme of the message, it should be as general as possible to help readers connect with the message, so it can stay in the reader's mind longer. However, using more general background and theme to connect with readers and special phrases to catch reader's attention is not only applied in text-based messages. In [2], it shows that

comics have been using similar techniques. Comics use general background and characters to make users feel more involved with the story, and use catchy phrases to catch user's attention to make the comic more appealing. The abstract characters and background in comics make it easier for readers to relate themselves to the story, thus attracting reader's interest and attention.

In the paper [3], it takes on a different aspect of the effect of framing. Instead of focusing on the word selection and sentence structure of a quote, this paper focused on how different reference point of a same sentence can result in reader's different response. It shows that variations of reference point of a decision can determine whether the reader will evaluate it as a gain or a loss, thus changing their decision. For example, choices involving gains are often risk averse and choices involving losses are often risk taking. This is essential for our design of messages to persuade behavioral change. Comics and graphics compared to plain text can better express the feeling of gain or loss to readers through the character's gestures and background. This supports our hypothesis that comic can be more persuasive to change reader's decision.

### 2.2 Comparison between Text and Comic

Our work isn't the first to address the comparison between text and comic. Previous research [4] has focused on comparing whether text messages or image/comic messages are more attractive to readers. The results showed that image/comics can raise user's awareness and have a greater chance to persuade behavioral change. However, this study retrieves the comics from the internet on a certain topic instead of customized generated comic. The drawbacks of this approach is that it is harder to control the quality and characteristic of the comic. Different authors of comic might have very different drawing style, resulting in differing effects on persuasion. Our work builds on top of the findings of this study that comic can better attract reader's attention. We generate customized comic messages from text messages to unify the comic style and evaluate the persuading effect.

Aside from the comparison between text and comics, research has also focused on comparison between other forms of data and their effect in persuading behavioral change. In the study [5], it compared two modes of presenting information about wind energy in brochure form: (1) photographs and (2) using cartoons as visual aids. To evaluate the effect, the research focused on comparing 3 measures: (1) audience's knowledge of, (2) attitudes toward, and (3) behavioral

intentions regarding wind energy. Results show that there is no significant difference between using photographs or comics in terms of knowledge and attitudes. However, visual aids shown in the cartoon/comics version showed stronger behavioral intentions (e.g., greater willingness to support changes) than the photo group. Because of the abstractness of comics, it can better engage its readers in the messages compared to photographs, making readers more willing to adopt changes. In this study, it mainly focuses on comic's effect on persuading readers to agree on changes conducted by others. However, in our study, we focus on comic's effect on persuading readers themselves to adopt behavior change.

### 2.3 Communicating with Comic / Graphic

Using comic to convey information isn't a new idea. Throughout the years, research on evaluating the effect of comic and graphic in communicating ideas have been more and more popular. From [2], it shows that different comic elements have different effects on the ideas and emotion communicated. For example, background shading, character gestures, and word balloon border style can all change the emotion and feeling associated with the message. This makes readers more emotionally engaged and more likely to accept the ideas conveyed by the comic. Other comic elements can help engage the readers, for example, research has shown that more abstract comic character can help readers relate themselves with the characters in the comic. This makes readers more engaged to the story and the idea expressed by the comic. Although previous studies have proved that comic can better attract reader's attention and engage them in stories, the research on using comic to convey formal information and persuade behavioral change is limited. Our study builds on comic's characteristic of attracting reader's attention. We want to further extend the research by understanding if comic can not only engage the readers, but also motivate them to take action.

From the study in [6], it proposed a comic-style solution to present qualitative research findings. The study proves that the modified comic panel layout for user experience reports can make it more likely for readers to read the whole report through. This study offers an innovative idea to present visual information through comic layout. In addition, text bubbles in the layout highlights additional information about the research and can better attract reader's attention compared to text label by the side of a report. However, this design is specifically for presenting

visual information such as user interface feedbacks. It is difficult to apply it to other forms of information or research findings. In our study, we utilize comic to present text posts on social network and extend the research to examine the effect in persuading behavioral change.

While comic and graphic become a more and more popular form of communication, other research has focused on the study of transforming plain text to comic scenes. This not only makes scaling of comic form messages easier, but also help people with no design expertise to generate their own comic or cartoon. In the paper [7], it presents a system WordsEye that is able to automatically convert text to 3D scene. With similar approaches to ours, the system works by tagging and parsing the text, converting them into semantic representation. Depiction rules are then used to convert the semantic representation to a set of low-level depicters representing 3D objects, poses, spatial relations, color attributes, etc. The system then uses the resulting depicters to manipulate the 3D objects that constitute the final, renderable 3D scene. The text to scene converting system proved that it is possible to transform between text and image through the use of tags and node model. However, the generated scenes in this study have no sense of emotion, they are just images transferred from plain text. Another weakness of this paper is that the system processes only narrative text, which contains obvious character and scene to extract. Our study extracts post from social network without the specification of characters and scenes. We designed our comic generating system based on the implementation of this study and modified the system to adapt to the social network setting.

# CHAPTER 3
# SYSTEM DESIGN

Since ancient times, people have used comics to express emotions, depict life events and record history. Over the years, more and more people have written comics either to communicate thoughts or just to entertain. A lot of researchers have been working on using the power of comic in persuading people and attracting attention in the recent years. People use them in a variety of different fields such as advertising and communicating. However, because of the heavy dependency on emotion and humor elements, only a small group of talented and experienced people can generate comics. This makes it hard to apply the effect of comic in scale. In this study, we propose a basic system that will be able to automatically generate comic from text sentences.

## 3.1 Comic Generation

If we take a closer look at each comic, it is not hard to see that every comic panel consists of several fundamental components. We categorize these comic elements into different groups:
(1) characters + gestures,
(2) color + shading,
(3) background,
(4) word bubble.

If we can decide the elements for each group, we can generate a comic by combining all the 4 layers. We use this concept to design our automatic generated comic system. For each group of elements, we have a template library of examples that we can choose from based on different parameters. For example, we have a mood score to depict the emotion associated with the comic. One of the features of comic is that it can better express the different emotion associated with the message we want to convey, as a result, picking the right group of comic element associated with a specific mood is important to make the comic consistent. We designed the system so that if a comic has a positive mood score, we will choose from the more positive gesture library for the comic characters. The mood score also effects the color shading of the comic since color and shading both have significant contribution on the feeling and emotion

readers receive. As a result, picking the right color and shading for the comic with respect to the message emotion is essential for a persuasive comic as well.

In addition to the emotion parameters, we also have parameters that depicts the relationship between characters. From previous research, messages are more persuasive if the person communicating this idea is someone the receiver relates to closer. We model this effect by categorizing the group of people in social networks. If a person is closer to a certain group of people, we give this relationship a higher relationship score. We reflect this score on the distance between characters in the comic and also the tone of the word bubble. The measurement of whether a person is closer in relationship with another person depends on the interaction between the two on social networks. We measure the number of times and frequency of interactions on social networks such as commenting and liking each other's posts and tagging each other in their photos to get the score of relationship between each user. We then categorize these scores into 3 groups: (1) Close friends, (2) friends, (3) acquaintance. Based on the group of relationship identified, we can change the distance between the characters and tone of word bubble to adjust to each individual cases.

One characteristic of comic is that it is easier to customize for each single reader. When we use only text in expressing message, the things that we can change to customize for each reader is very limited because we have grammar and language rules to follow. We can not add random customized text to the message or it wouldn't make sense to the reader. However, this is not the case for comic messages. Although there are usually some rules for comics agreed upon author and readers, comic producers normally have larger freedom of adding elements into the work. Comic designers usually add customized elements for a certain group of readers through changing the outfit of characters or adding items in the background, for example adding a ribbon tied to the character's neck to address businessmen or adding a map on the wall in the background to address outdoor lovers. In our design, we mainly designed the system to customize to each user by choosing different background for the comics. We have a template library of backgrounds with tags associated to choose from. According to the reader's interest and background, we can then extract the most suitable background for the comic. Since our main source of information will be from the social network, it is not hard to get information from user's habit and interest. For example, we can understand a user's interest and hobby from the pages he/she liked or followed or understand if he/she is a night owl from his/her time online.

We can also integrate this information from the social network with a survey to help us better understand the user. We will extract these data about the users to generate tags that represent the user. We will then use the tags representing users to match and search for suitable background for the comic. In this work, we haven't finished implementing the customize background design yet. However, customize background selection and character outfit selection are both feasible design that can not only improve the persuasiveness of the comic but also make the comic more interesting and engaging. We will expand more details in the future work section.

### 3.2 Data Source

As previously mentioned, our main goal is to prove that comic posts compared to traditional text posts on social network settings can better persuade people to adopt behavioral change. As a result, our main source of data comes from the users account on social network. From the previous section, we generate the comics from tags we extracted from user behavior and preferences. With the tags, we can then search through suitable templates in the library to build up a comic. However, how do we generate these tags from user's social network usage and preferences is an important problem. Figure 1 is a flow chart that gives us a better understanding of how we process data to generate tags.

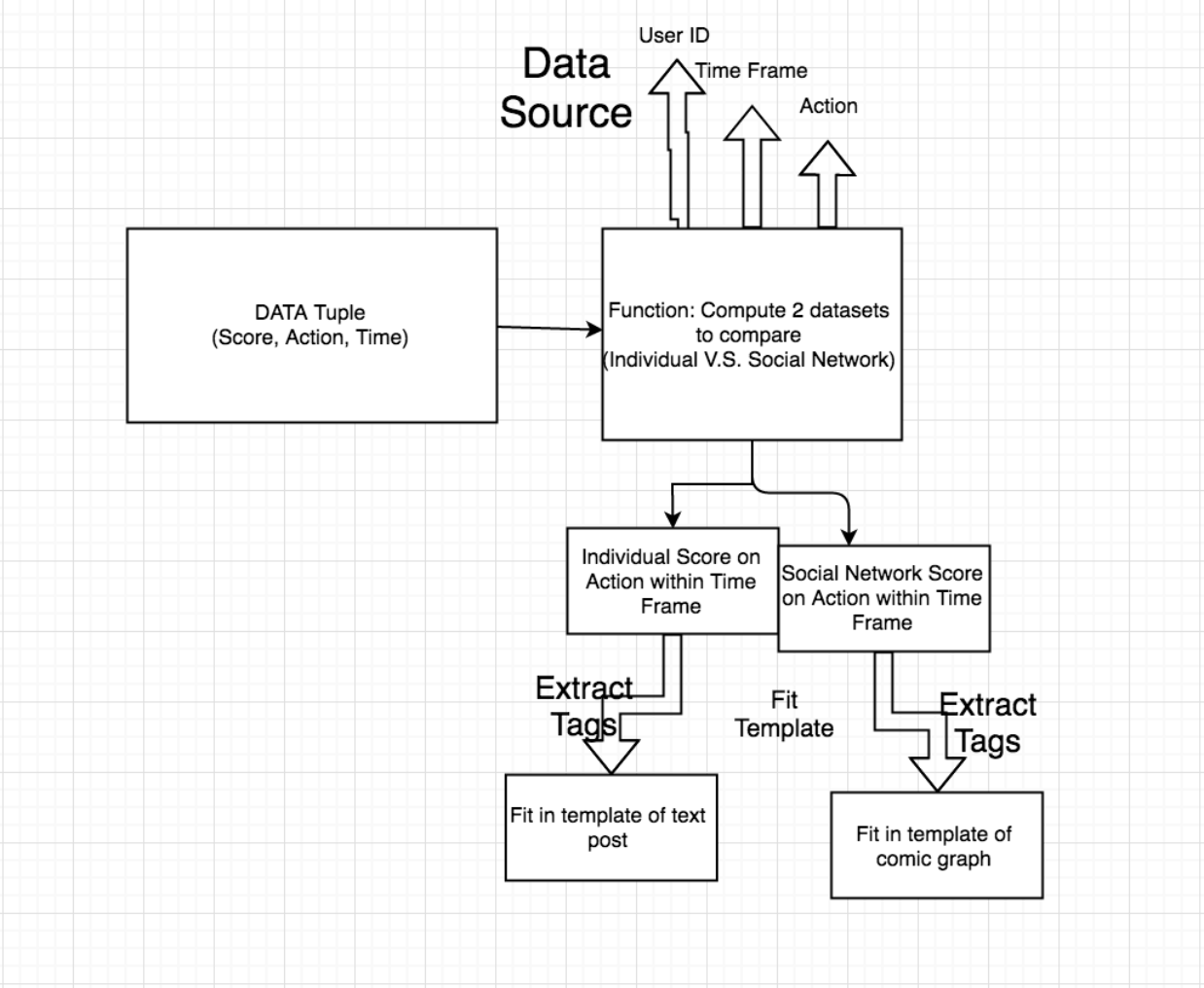



**Figure 1:** Flow Chart of Data Processing

In order to examine the level of persuasiveness for the posts, we design the post to be a comparison on a desired action between the user himself/herself and his/her friend group. Some sample posts include: (1) You have been exercising more than 95% of your close friends in the past weeks, or (2) 60% of your friends have been going to the gym at least 3 times a week. In this study, we mainly focused on one single action, which is exercise. In order to persuade readers to exercise more, we analyze data from the user's friend group and compare it with the user's behavior itself. Through comparison, we want to motivate users to adopt behavioral change. Figure 1 shows how we treat individual posts on social network as data tuples for our system to calculate a total score throughout a specific time frame. For each post, we use natural language techniques to identify the action type associated with the post, the intensity level of the

action and the time when the action takes place. With all the posts from the social network, we can extract the data tuples and summarize the result score for different group of users. For example, we can specify a time frame and collect all data tuple scores of a single user doing an action, which is the individual score in figure 1. Using the same technique, we can get a score for all the friends of a user, which is the social network score in figure 1. From the score of action in a time frame, we can extract tags for text summarization posts or comic posts. Example tag combination we use for text posts or comic generation:

(1) User: Vincent (Id: 3048);
(2) Friend Group: Normal friend;
(3) Time Frame: Last 2 weeks;
(4) Action: Go to the gym;
(5) Comparison: Higher score;
(6) Level of comparison: Much higher/lower;

### 3.3 From Tags to Text/Comics

After extracting tags that describe user's action progress throughout a time frame from activities on social network, we use these data tags to generate corresponding text messages and comic messages to motivate behavioral change. First, we generate the text messages by fitting the tag combinations into sentence templates. One of the examples of text posts we generated is: "Over the ①past 2 weeks, you are among the ②top 5% of ③exercising in your ④friend group." In this text post, the underlined parts are the phrases inserted using our combination tags. In this particular example, space① comes from the time frame tag, space② comes from level of comparison tag, space③ comes from action tag, and space④ comes from friend group tag. We have around 30 text templates with spaces that extract and apply information from the tag combination.

As for the comic messages, we used Comix I/O, an open source project that helps us create xkcd-style comics using HTML markup [9]. We create a library with a variety of different comic elements using the Comix I/O markup. Our tags-to-comic algorithm selects comic elements to build the comic panel from the library we previously generated. We design the comic using a similar algorithm to what we used to generate text messages. Recall from section 3.1, in

order to generate a comic panel, there are several parameters we need to determine: (1) characters and gestures, (2) color and shading, (3) background, (4) word bubble. For each of the comic parameter, the comic generating algorithm based its selection on the tag combination received.

The gesture parameter is dependent on 2 different tags, the comparison score and level of comparison tag. Based on whether the reader is having a good progress compared to the friend group and how big the difference of the comparison score is, the system will choose from either positive or negative gestures from a gesture library. We design the gesture library in a JSON format with two main categories: positive and negative, each with 3 levels of intensity. Based on the comparison between user and its friend group, the algorithm will select the corresponding gesture and apply it on the characters.

The color and shading parameters are mainly dependent on the emotion of the comic. The system decides the emotion associated to the comic based on the comparison score and level of comparison tag. If a user has a positive progress, the background color will be set to bright with warm colors. On the other hand, negative progress will make the background color darker with additional shading. Based on the difference of the user and his/her friends, the system will select shading from 3 different levels.

We generate the word bubble content in our comic using the corresponding text message. We designed the algorithm to place the text message inside the word bubble of the main character. The other character will be responding to the message based on the comparison result. For example, if the result is positive, the word bubble for the other character will be “Nice work” or “I’m proud of you”. However, if the result is negative, the word bubble for the other character will contain message such as “Oh no” or “Let’s go to the gym more”.

In our comic, the system decides the character and background parameter randomly. We select characters and background for the comic without information from the tags. However, it will be an interesting future work to customize the character element based on the user and his/her friend group. We can also customize the background element based on information about user preference. Improvement on the system might include allowing users to pick design for their character avatar or background in the comic.

With all the individual comic elements chosen by our algorithm from the library, we compose the comic panel by arranging the elements in their pre-determined positions.

# CHAPTER 4
# HYPOTHESIS

Persuading behavioral change has long been an important topic in academia and industry alike. Understanding what kind of characteristic in a message can have a more powerful impact in people's mind is the foundation for a lot of future studies. Persuading readers to change their habit and try new products is the main purpose of advertisements. Researchers have been working on examining different aspect of a message to generate more persuasive messaged. Through knowing what types of message can be more persuasive, people will be able to convey their idea more effectively. In this study, we propose a hypothesis to figure out the effect of comic in persuasiveness.

## 4.1 Main Hypothesis

Our main hypothesis is that comic-style post compared to text-based post on social network can better persuade people to adopt behavioral change.

## 4.2 Other Hypotheses

Aside from our main hypothesis, there are several other hypotheses we propose to better understand the persuasiveness of comic in detail:

(1) The color elements of comic can help give a larger impact in reader's mind, thus making the message more persuasive.
(2) The shading elements of comic can effect reader's emotion when reading the comic, thus have different effect in perceiving the message.
(3) The gestures of characters in the comic can help the character better express their idea and have a bigger effect in persuading.
(4) The distance between characters in comics is a way to show the relation between both sides. Will changing the distance between characters have an effect on the persuasiveness of the comic? Our assumption is that closer distance can help readers relate to their closer

friends, where previous research has already shown that a message is more persuasive when said by someone close to the receiver. We believe that closer distance between the characters will help readers relate to their close friends, making the message more persuasive.

### 4.3 Assumptions

In order for us to examine our hypothesis, there are several assumptions that we need to consider.

(1) Users will honestly post activities of their action on their social network.
(2) The system is able to accurately identify and categorize different actions on social network using natural language techniques.
(3) Users are willing to provide their data on social network activities to the system.
(4) The goal of the system aligns with the user's goal. (For example, persuading to adopt healthier behavior through going to the gym more is what the user wants to achieve)
(5) Users will be able to relate to the characters in the comic.
(6) The comparison between user's friend group and user itself can motivate user to change behavior instead of giving up.
(7) The level of action comparison will have different level of effect on user's behavior. For example, if the user is losing his/her friend by a lot, this will motivate him/her to exercise even more, not less.

# CHAPTER 5
# EXPERIMENT DESIGN

Examining the result of research on human perspective is not an easy task. Because of the subjective nature of human perspective, we need to take a lot of additional aspects into consideration. In this study, the main goal of the experiment is to examine if comic posts are more persuasive than text posts. We strive to control the message content of both options so that we can test only on the difference between text and a comic layout. The experiment conducted in this research consists of 3 parts:

(1) comic generated from tags,
(2) pretest survey that compares the persuasiveness of text versus comic,
(3) final survey that compares the variation of comic elements and its effect in persuading behavior change.

## 5.1 Comic generation

From previous sections, we know that comic consists of several different layers of elements, including background, characters…etc. As a result, in order to completely examine the effect of comic in persuasion, we have to generate all combinations of comic. As mentioned in chapter 3, each of the elements of comic has several different option and can have various effect on message communication. Based on different scores and tags, we managed to generate a combination of different comics for evaluation.

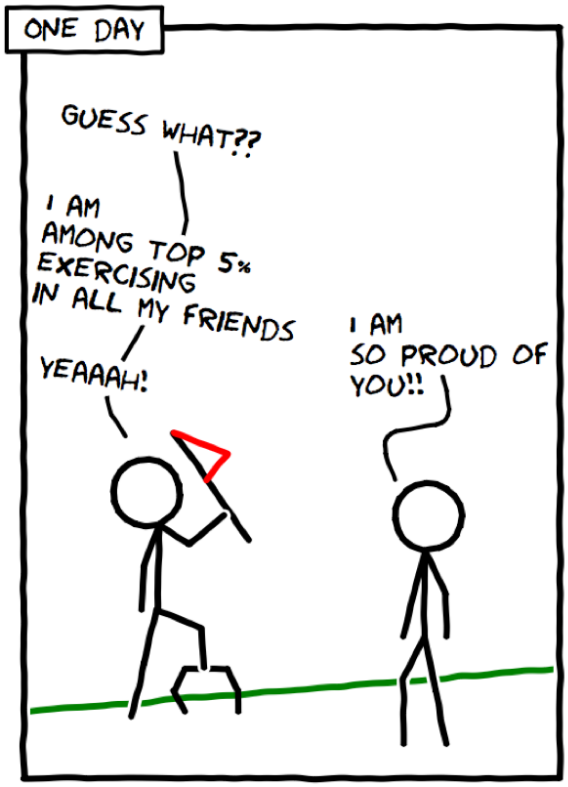



**Figure 2**: Example Comic Post of Achievement.

Figure 2 shows an example basic comic generated to express the message "You are among the top 5% of exercising in your friend group". We consider this comic example basic because all of its parameter is set to default, for example, background color and shading are both set to none and distance between the characters are set to normal friends. We will show some other example comics we generated that include different aspect of comic below.


**Figure 3**: Example Comic Post for Close Friends

Figure 3 above shows how the system adjust the comic to express closer friends on social network. Given a relation score, the system will adjust the suitable distance between the characters to show different relation level.


**Figure 4**: Example Comic Post with Background Color

In our study, the color of the comic relates to the emotion the comic wants to express. For example, if the comparison is positive, the comic will be mainly in warm colors, however, if the result is negative, the comic will be more darkish with colder colors. Figure 4 shows an example of basic comic with color. The effect of persuasiveness of these comics will be examine in the survey conducted.

### 5.2 Experiment Survey (Pretest)

In order to understand the persuasive effect of different comic and its comparison with text messages, we conducted a survey to compare the two. To make the messages straight-forward enough for users to evaluate their persuasiveness, we specially designed the messages in our survey so it follows a specific format to encourage behavior change. As previously

mentioned in Chapter 3, we generate our messages from a combination of tags on the time, action, comparison, and level of difference. From these tags, its easy to fit in the message template that express all of the ideas. Example messages include: (Underline denotes the different tags used to generate messages)

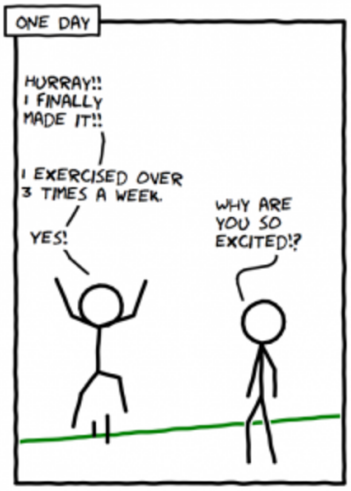
(1) Over the past 2 weeks, you are among the top 5% of exercising in your friend group.

(2) 60% of your close friends have been going to the gym more than you last week.

We believe that using straightforward messages in our survey will help us evaluate the persuasiveness of text and comics. As for the comic counterpart, it will express the same message in graphic form using literally the same tag combination. The example comic message for the survey will be similar to the figure 3 & figure 4 above. For the survey, we ask questions for the participants to compare the two options: the text messages versus the comic message. Instead of giving participants only 2 options to choose whether text is more persuasive or comic is more persuasive, we let participants choose from 0 to 10. In the 0~10 range, 5 is neutral meaning there is no preference on which side is more persuasive, 0 means that text is extremely persuasive compared to comic, and number 10 the opposite. This design gives participant the freedom to express their preference for the 2 options even if the tendency is subtle sometimes. The following are some sample questions we have in our survey.

Congrats! You have reached your goal of exercising 3 times a week.

or




On a scale from 0-10, do you think the text or the comic above is more persuasive ? (5 being neutral)

| Text more persuasive | | | | | Neutral | | | | | Comic more persuasive |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |

**Figure 5**: Sample Question on Survey

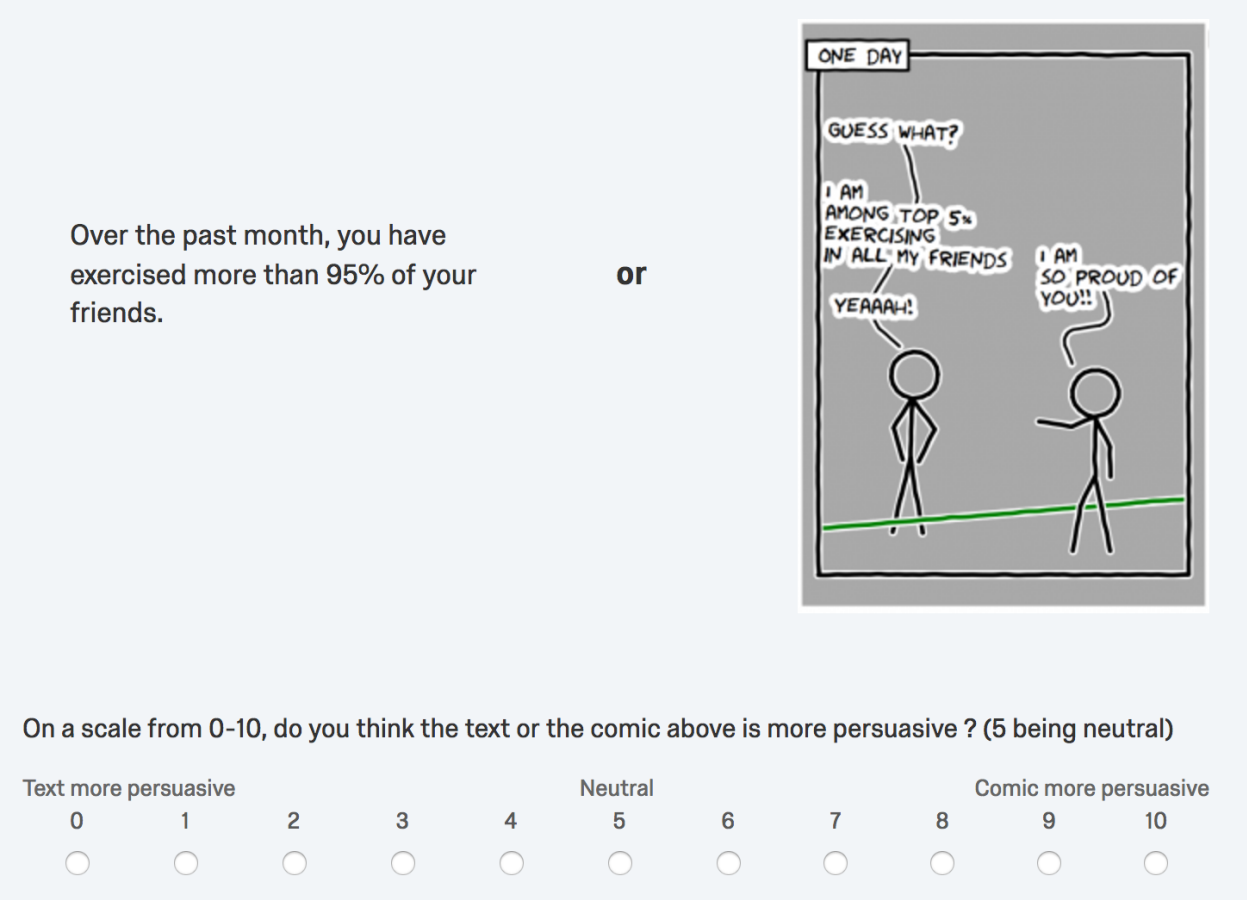



**Figure 6**: Sample Question 2 on Survey

From the above Figure 5 and Figure 6, we can see that the questions in the survey are intuitive for the readers to compare the 2 messages placed on both sides with a scale from 0 to 10. Each question consists of a text message on the left and a comic version on the right. In order for the participants to get more engaged with the situation depicted by the survey, we provide background introduction before most of the questions. For example, we will first explain that Bob, which is the main character, have a goal to exercise more and improve his habit. Then, the following question and messages will center on the progress Bob has done so far. Participants will try to relate himself/herself as Bob and choose that if he/she sees these messages on the internet, which ones will appear more persuasive and by how much.

The survey includes a total of 8 questions. Within these 8 questions, we include 3 basic comic questions and 5 questions with additional parameter changed. The basic comic questions are the comparison between text and comic with default settings for all parameter. This includes

the background color, shading, distance between characters and the character gestures. The purpose for these questions is to provide a baseline for comparison between text/comic and better allow us to understand the effect of each individual parameter. The other 5 questions consist of comic each with a single parameter changed. For example, in figure 6, the parameter changed is the shading with all other parameter set to default, while in figure 5, we changed the gesture of the characters to express happiness with all other parameter set to default. One thing to note in the survey is that we didn't design all the comic in the questions to follow the intuitive improvements, for example, some of the comic might have shading even if the message that we want to communicate is positive. The reason for this is that we want to examine the effect of each parameter. Changing these elements for enhancement is as important as for contradiction. We will give a more detailed explanation in the next Chapter, where we discuss the experiment result.

### 5.3 Experiment Survey (Final)

In addition to our pretest survey, we included another survey to better understand the effect of each comic parameter in persuasion. The result from pretest has proven that comic messages are more persuasive compared to text messages. It has also shown that some comic parameters correlate to the persuasion effect, while others are not. To better understand what comic parameters have the most impact on persuasiveness and their correlation, we designed another survey on Amazon Mechanical Turk.

#### 5.3.1 Lessons from pretest

From our pretest survey, we have proven that comic messages compared to text messages are more persuasive in behavioral change. The result has also shown that different comic elements contribute differently on persuasiveness. However, one of the drawbacks of our pretest is that we have too few participants, resulting in lower confidence measures. In the final survey, we designed the experiment to allow more participants to evaluate the findings from our pretest. In our pretest survey, we examined the effect of persuasiveness on 4 different comic parameters: (1) gesture, (2) distance between characters, (3) shading, and (4) color. In addition to the

comparison of text with default comic, we added questions that compare text with comic that modifies each of the parameter above in our pretest. The result proves that parameters including gesture, distance, and shading have significant effect on persuasiveness while color has very little effect on comic persuasion. The final survey builds on this foundation to explore the 3 parameters (gesture, distance and shading) in detail. The main purpose for this survey is to compare the 3 parameters and examine the correlation between these parameters and persuasiveness measures.

### 5.3.2 Survey Design

In order to better understand the effect of these parameters, we use our comic generator to generate all possible combinations of comic based on the variance of these parameters. For each of the 3 parameters, we have 3 different levels of variation. This sums up to a total of 27 comic combinations. For example, one of the combinations will be a comic with no gesture, farthest distance between characters and medium shading. For each of the comic combination, we compare it to its corresponding text message and let participants use a slider to express their preference for the messages. Figure 7 below gives us an example.

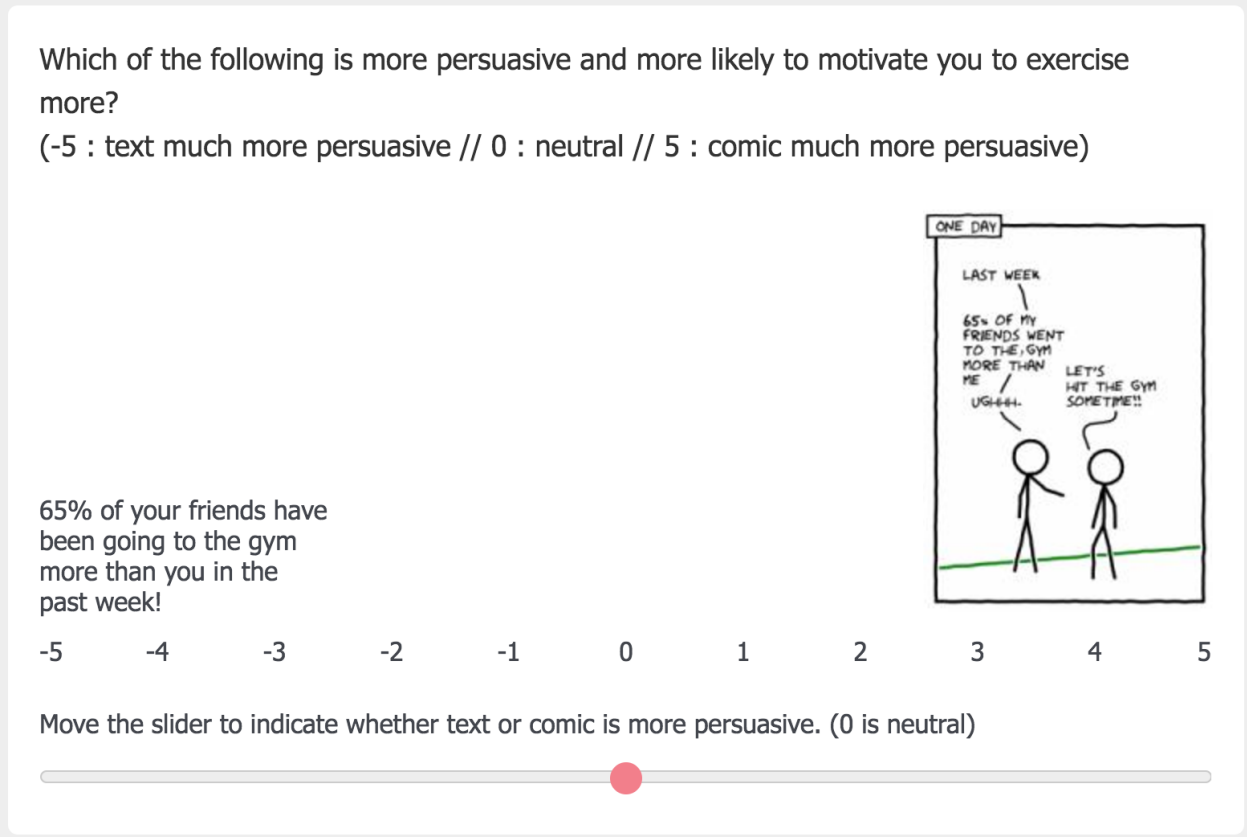



**Figure 7**: Question on Final Survey

In the figure 7 above, the comic denotes the parameter combination of minimum gesture, minimum distance between characters and minimum shading, one of the 27 total combinations. Each survey will have 5 different questions randomly picked from a pool of 30 questions. These 30 questions cover all the 27 comic combinations with 3 repeated combinations. The survey has a total of 30 participants recruited from Amazon Mechanical Turk, accounting for the 150 answers collected. The reason that we use Amazon Mechanical Turk to recruit participants is because it covers all demographic groups for better study purposes. After participants on Amazon Mturk agrees to complete the task, the system will direct he/she to complete the survey on Qualtrics.

Similar to our pretest design, the survey will start with a brief background overview of the situation the characters are in. We give this introduction before the survey to better relate participants with the story and help them understand the question. The introduction mainly focuses on 3 ideas: (1) the messages will appear on social network as posts, (2) the characters have a goal of achieving a healthier life through exercising more, and (3) the definition of

persuasiveness is how likely the message is going to motivate the participant to exercise more. After the introduction, the survey will ask participants 5 comparison questions randomly selected from the pool. To ensure that participants don't game the system, we added additional comparison questions and objective questions to validate the response. After participants complete the survey, he/she will get a random generated code to report back to Amazon Mturk for record.

In addition to recruiting participants from Amazon Mturk, the final survey is different from the pretest survey in several other designs. One of the improvements is the use of sliders to record preferences instead of multiple check box. The sliders are not only more intuitive for the participants but also easier for researchers to capture subtle response difference calculated to the decimals. The final survey also changed the min/max value of response from 0~10 to -5~5 with 0 being neutral. The shifting of min/max value to make it symmetric will solve the situation of participants having a preference for certain numbers. The improvement in our survey design helps us to conduct the research without bias on the comparison of messages.

### 5.3.3 Unbiased Data Collection

Studies that involve collecting data from human perception and subjective preferences can be difficult. Measurements to ensure that the experiment isn't biased toward certain options is essential to collect useful data for study. Furthermore, since there will be no correct answer for questions on preferences and subjective perception, ensuring that participants are answering according to their real thoughts is an important task. This is especially the case when using crowdsourcing platform such as Amazon Mechanical Turk. One advantage of Amazon Mechanical Turk is that the worker base covers people from all different background and settings, making it easy to conduct general study that covers all demographic group. However, this also means that the quality of the participants is harder to control. Because there will be no right answers for the questions, making sure participants aren't gaming the system with random answers is important to collect useful information.

Aside from the built-in mechanisms Amazon has to filter out low-quality participants such as acceptance rate and number of accepted tasks, we designed several mechanisms to ensure the fairness and usefulness of our data collection process. First, the survey randomizes the

order of text message and comic message in our questions. Some of the questions in the survey will have text message on the left, while others will have comic message on the left. The reason for this design is that most of the population reads from left to right and might have preconceived notions for messages that appear first. If we didn't change the order of the messages, it might affect the result because of preconceived notions from participants. This will make the result biased towards the option on the left or right. In order to collect unbiased information, we need to ensure that the messages presented to the participants are in random order. Second, we design the survey to ask some objective questions in the middle of subjective comparison questions. Previous research [8] has shown that including objective questions in a sequence of subjective questions can largely encourage participants to truly express their opinion in subjective questions. The objective questions not only help researchers validate if a participant is gaming the system with random answers, but also help participants better express their opinion on subjective measures. In our survey, we use questions with objective and straightforward answers such as comparison between numbers to help us filter out gaming participants. Finally, we design repeated question in our survey to ensure that participants aren't giving random answers on preference. We design the survey to repeat at least one parameter combination of comic using a different story. Our purpose is not to get the exact same answer from the repeated question as the original one, because it will be hard for a slider type question. However, if we discover that in the original question, this participant has a strong preference for text message over comic message and he/she has a completely opposite preference for the repeated question, it is very likely that this participant is gaming the system without thinking. We will know that the data from this subject is less useful even if he/she passed our objective question validation. We will not approve this kind of response and exclude the data from our result analysis.

# CHAPTER 6
# EXPERIMENT RESULT

From the surveys we conducted, we gathered useful information on the comparison between comic and text messages. Recall from chapter 4, our hypothesis is that comic style posts can better persuade readers to adopt behavioral change when compare to plain text. In this chapter, we will analyze the survey results to provide proof to support our hypothesis. The result from our first survey will address our main hypothesis of persuasive comparison between comic and text. The data also serve as a foundation for our final survey design. The result from our final survey mainly addresses the other hypotheses regarding each comic parameter and their effect in persuasion.

## 6.1 Pretest result

From the previous chapter, our pretest survey consists of 8 questions that compare text and comic with a scale from 0~10. In this survey, we design the scale so 5 is neutral, 0 means text is much more persuasive and 10 means comic is much more persuasive. We collected the data from 15 participants, a total of 120 answers. Based on the data, we present a data distribution in figure 8 to support our main hypothesis.

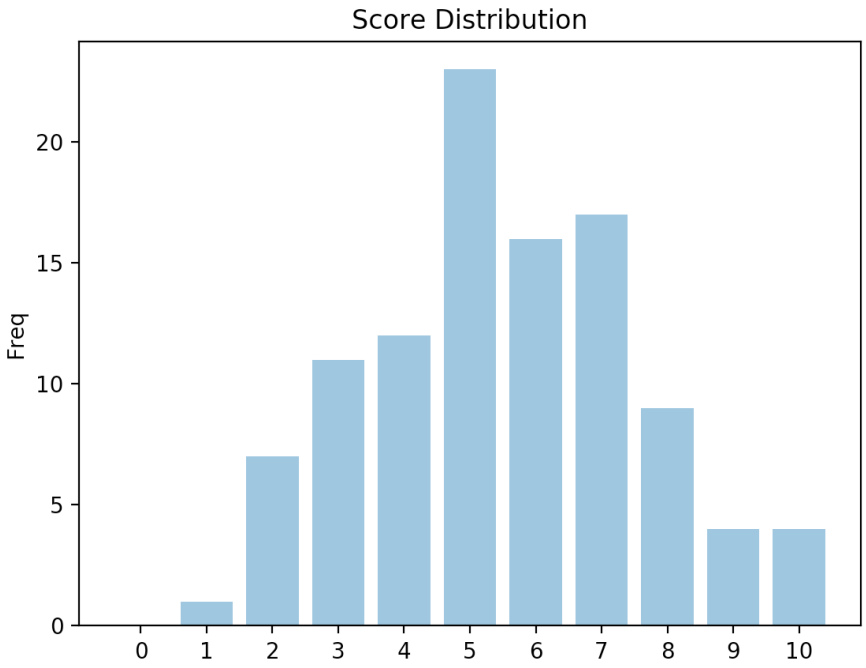



**Figure 8**: Score Distribution of Pretest Survey

From figure 8, we can observe that the peak lies on score 5 and the distribution has a tendency towards scores more than 5. The overall mean score is 5.52, meaning that participants prefer comic over text to motivate behavioral change. This not only supports our main hypothesis that comic-style posts compared to text-style posts on social network can really persuade behavioral change, but also pointed us to interesting directions on supporting our other hypotheses. When we take a closer look at our data from the pretest survey, we notice that there are certain questions that have stronger tendency towards text instead of comic. Within the total 8 questions, we notice 2 questions with tendency towards text than comic. One of the questions is a message of positive progress expressed in a comic with shading as in figure 6. Another question is also a message expressing positive progress in the comic, however with characters doing sad gestures as in figure 9.

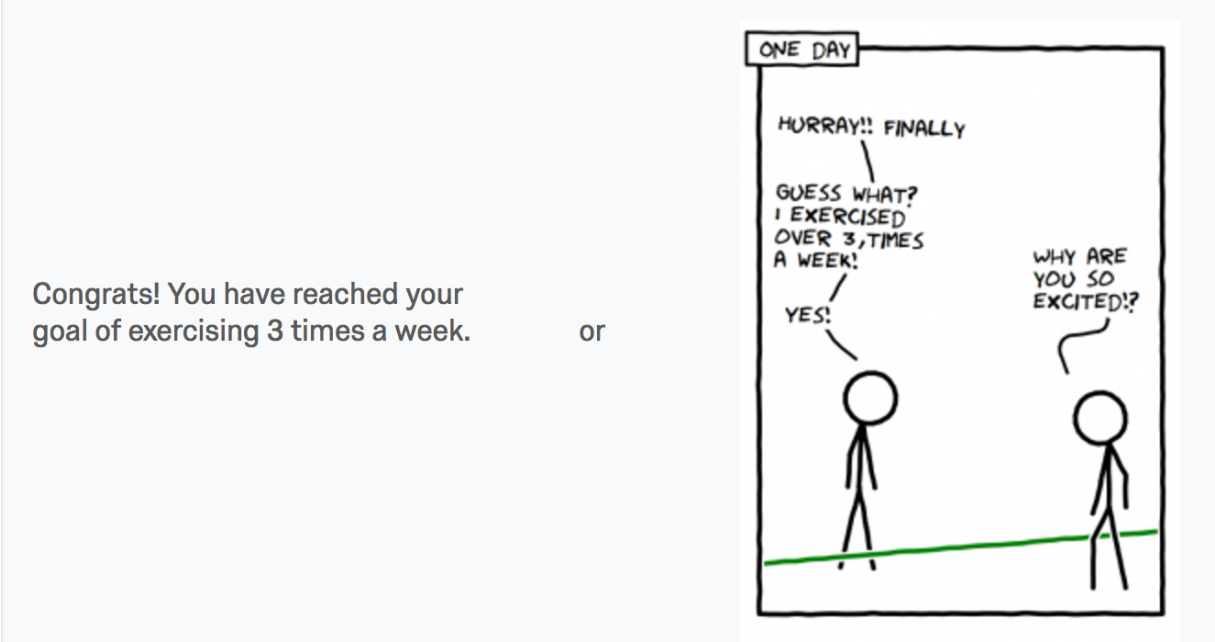



**Figure 9**: Question in Survey with Contradicting Parameter

From both of the examples above, the questions got a mean score of 4.23 as opposed to the overall mean of 5.52. The mean score and distribution of these 2 questions (as shown in figure 10) are very different compared to the overall score distribution. From figure 10, it is obvious that most of the scores are scattered below 5, with 4s and 5s being the most frequent. This shows that comic using contradicting parameters will greatly affect its persuasiveness. For example, if we add dark shading to express positive messages or the characters look depressed when expressing something happy, more participants will prefer text over comics. This not only shows the importance of comic elements' consistency with comic messages to persuade, but also shows that comic elements can have significant impact on persuasiveness. This is a foundation to our final experiment on comic parameters and their correlation with persuasiveness.

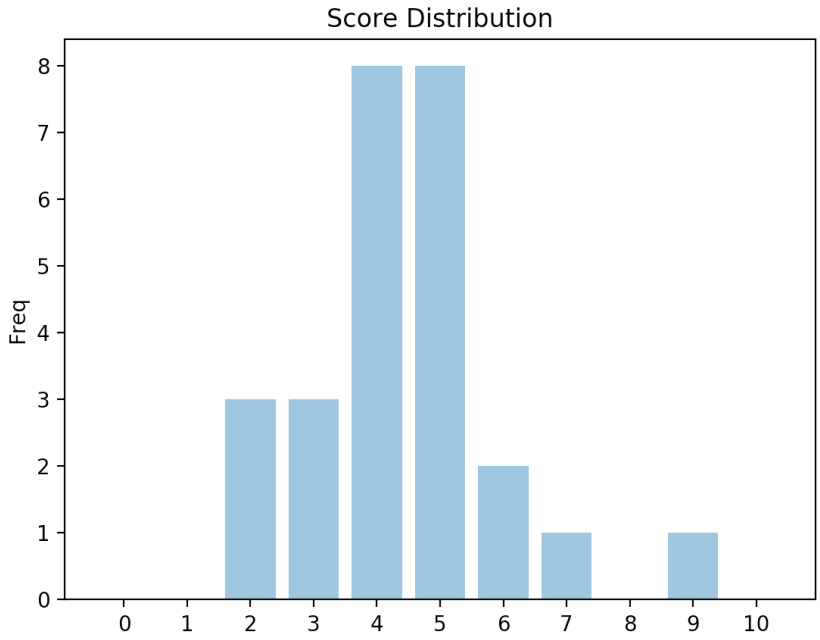



**Figure 10**: Distribution of Questions with Contradicted Comic

Figure 11 below shows the distribution of all other 6 comics without the 2 parameter contradicting comics mentioned in figure 10. There is a significant tendency towards score bigger than 5. The mean score for this distribution is 5.89 as opposed to the overall average of 5.52. This distribution result supports our claim that comics using consistent parameters with its messages is significantly more persuasive than text messages.

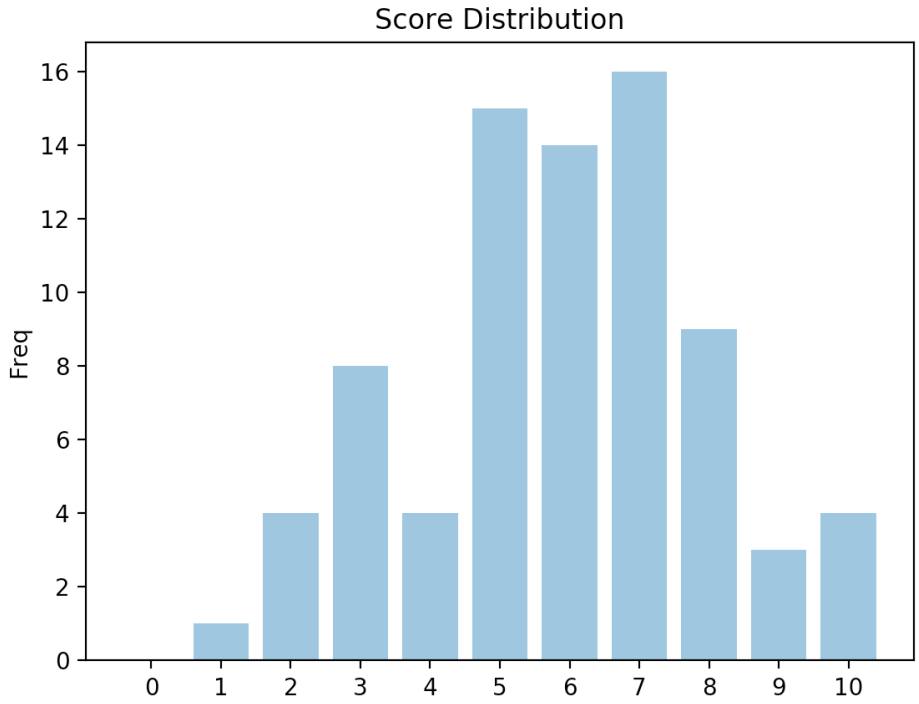



**Figure 11**: Score Distribution without Contradicting Comics

Finally, we introduced Bayesian model regression to help us understand the importance of each coefficient. From applying Bayesian model regression to our data, we will be able to identify the weight of each coefficient as well as determine the degree of uncertainty with respect to each term. For each of the comic, we labeled its parameter combination for 4 parameters: gesture, distance, color, and shading. Label 0 denotes that the comic doesn't have any variation for that variable, for example, no gestures or distance between characters set to minimum. On the other hand, label 2 means that the parameter is set to largest, for example, obvious gestures and larger distance between characters. Every comic will have a combination of labels for the parameters along with the score as 'y'. We used each answer from our participants to build tuples that include the 4 labels and persuasive score. From the tuples containing information of the parameter labels and score, we can build Bayesian regression model to help us understand the importance of each parameter and their correlation with score. We used Bambi high-level Bayesian model-building interface in Python to process our data tuples. For our Bayesian model, we used a prior of Cauchy distribution and categorical labels to train our model. Figure 12 shows the regression result from our Bayesian model with different coefficient for our parameters.

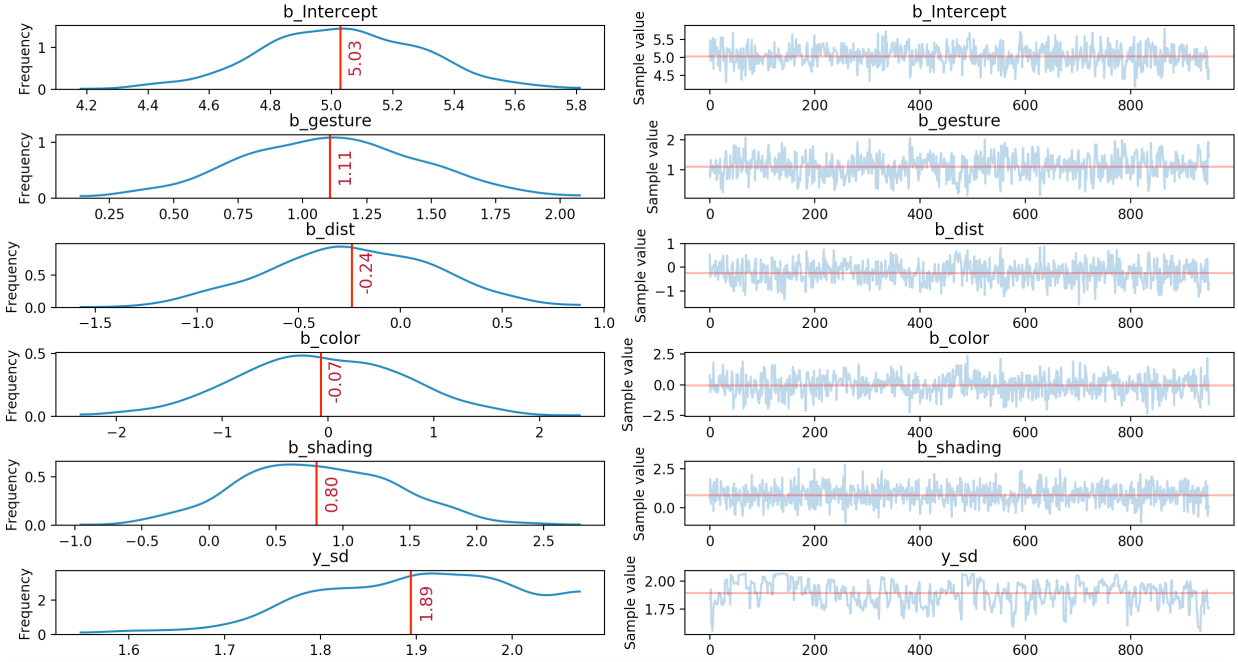



**Figure 12**: Bayesian Model Regression of Comic Element Coefficient

From the 120 data tuples, we sampled 1000 data to build our regression model. In figure 12, there are a couple of things to see. On the right side, the sampling chains of 1000 samples for individual parameters are all well converged and stationary. There are no large drifts or other odd patterns within these samples. On the left side of the figure, it's a summarized table of the corresponding sample chain on the right side. From the left side, we can observe the maximum posterior estimate of each variable, which is the peak in the distribution. The number next to each red line denotes the regression coefficient for each parameter. The distribution shows that b_gesture has the largest regression coefficient at 1.11, followed by b_shading at 0.80. The regression coefficient for b_color is nearly 0 at -0.07 and b_dist for distance parameter negative at -0.24. This shows that parameters including gesture and shading have positive correlation with y score with coefficient around 1. On the other hand, distance parameter has a negative correlation with y score meaning that participants prefer larger distance between characters. We can also observe that the regression coefficient for b_color is nearly 0, meaning that the variance of color in our comic doesn't have a big influence on the preference score. One thing to note is that shading is labeled as 0 when there is no shading and negative when shading gets darker. The positive correlation of b_shading denotes that less shading makes comic with positive message

more persuasive. The last distribution on the left is the standard deviation of our normal. From figure 12, we can see that the model has a y_sd of 1.89. The parameter "y_sd" denotes the standard deviation for the y score (persuasion score). From this parameter, we can understand how dispersed our data score is. We will compare this parameter with the result from our final survey in the next section.

Aside from the statistical result, we also collected feedback from participant's opinion on the comic we generated. Some participants reflected that the comic form messages sometimes have over exaggerated emotion and gestures, making it less persuasive compared to plain text. Other participants have also reflected that overly exaggerated emotion makes the comic seemed less formal. The comic can better attract their attention, but because it seems more casual, it is less persuasive to convey ideas. These are some information we can take into consideration when designing future comic posts.

### 6.2 Final Survey Result

From the previous chapter, our final survey consists of 5 questions that compare text and comic with a scale of -5~5, one objective number ordering question, and a repeated text/comic comparing problem to validate the response. In this survey, we design the scale so 0 is neutral. However, -5 might mean either comic is more persuasive or text is more persuasive. The reason for this is because we randomly change the left/right order of the options to make the selection fairer. We collected the data from 26 participants, a total of 130 answers. Based on the data, we present the data distribution in figure 13 to support our hypothesis.

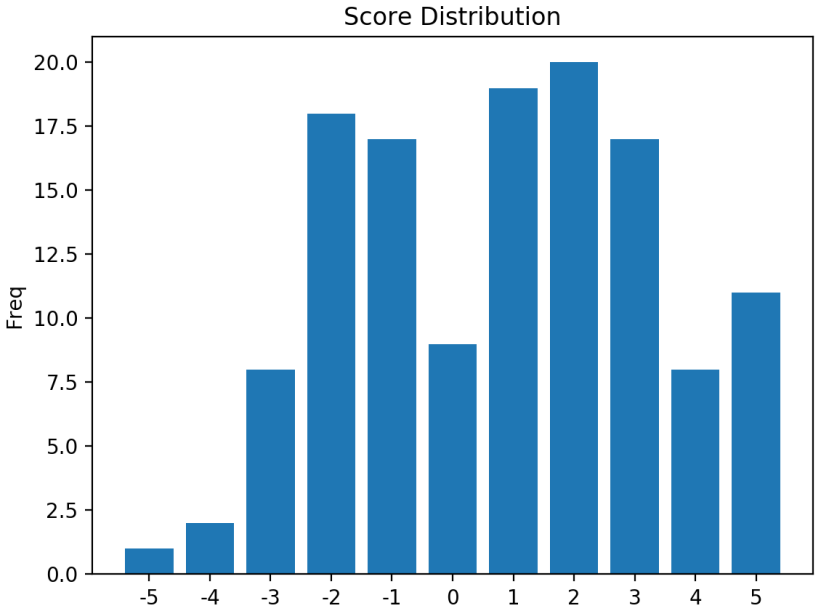



**Figure 13**: Score Distribution of Final Survey

Although in the questions of our survey, we randomly changed the left/right order for text and comic comparison, in our result analysis, we unified the measure and the score of -5 ~ -1 denotes preference for text, score of 0 denoted neutral, and score of 1~5 denotes preference for comic. This makes it easier to analyze the data collected. From figure 13, we can see the score distribution of the final survey. Most of the preference scores center around -2 ~ 2, with score 1 having the highest frequency. From the distribution, we can see that most of the participants preferred comic over text. The mean score is 0.83 for our final survey, suggesting that within our 130 answers collected from the Amazon Mechanical Turk, the majority prefers our comic messages over plain text messages. Compared to our pretest results, the final survey mean score of 0.83 (score 0 neutral) is better than our former result of mean score at 5.52 (score 5 neutral) by around 6%. The result from our final survey supports our main hypothesis that comic-style post compared to text-based post on social network can better persuade people to adopt behavioral change.

One thing to note for our final survey is that within the 35 participant data we collected from Amazon Mechanical Turk, only 26 of them are used in our study. The main reason for the data selection is the obvious gaming behaviors when completing our survey. Among the 9

rejected cases, we rejected 4 of them because of conflicting and random chosen answers. We observed that these participants answered the same repeating question with completely different answers and have confusing preference on comic/text throughout our survey. We rejected another 3 cases because the participants had conflicting choices with their feedback, indicating that they might not fully understand the instructions and made the response with false assumptions. For example, in one case, the participants expressed that he has a strong preference for comic messages, however, in his preference selection, he chose text in most of the comparison. We think that these misunderstanding cases might affect out result and decided to discard them. We rejected the other 2 cases because the participants didn't pass our objective question of sorting a group of numbers from small to large. We feel that the participants weren't focusing on the questions and were trying to game the system. As a result, we also discarded these 2 cases.

One thing to learn from doing experiment on Amazon Mechanical Turk is that the quality for work varies from case to case. It is important to have additional questions to validate the response from workers on Amazon Mechanical Turk. This is especially important for subjective questions because there will be no correct answer and it will be easy for the workers to game the system. Additional questions such as repeating questions or simple objective questions will help to filter out these kinds of workers. The validation process took us some extra time, however, it is needed to keep our data consistent and useable.

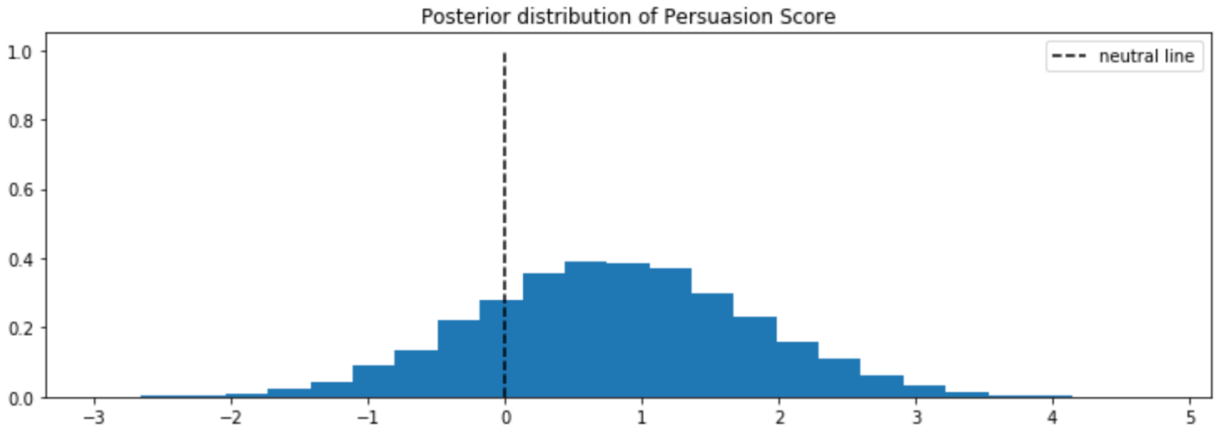



**Figure 14**: Posterior Distribution of Persuasive Score

In addition to the score distribution bar chart in Figure 13, we also included a posterior distribution on our final survey result in order to help us understand how likely participants will prefer comic. For the posterior distribution shown in Figure 14, we used a uniform prior for scores from -5 to 5, assuming we have no prior knowledge on the tendency. From the posterior distribution shown above, we can see that the distribution has a tendency towards positive scores (comic preference) with the peak centered around the data mean of 0.83. The vertical dotted line denotes score 0, which means neutral. Based on the distribution, the probability that the score is above 0 is 0.745. This result is greater than 0.5, meaning that the probability of a preference towards comic is 0.745, greater than the probability of a preference towards text: 0.255. This supports our claim that participants prefer comic more when compared to plain text.

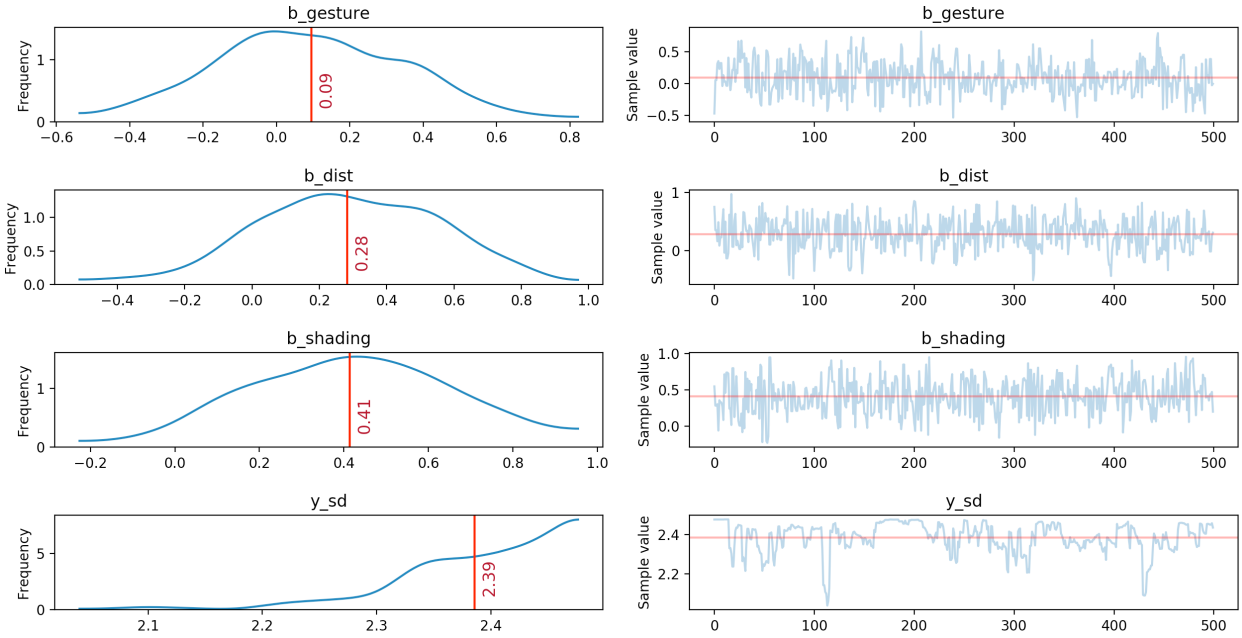



**Figure 15**: Bayesian Model Regression of Comic Element Coefficient

From figure 15, we can see the Bayesian Model regression for our final test's result. Compared to the pretest result, the final survey's results have much narrower distribution, meaning higher confidence level. Although the parameter coefficients have differing results compared to our pretest's, the reduced variance provides additional insights to the data. Below, we compare and analyze each parameter result to provide more detail on the persuasion effect of each parameter.

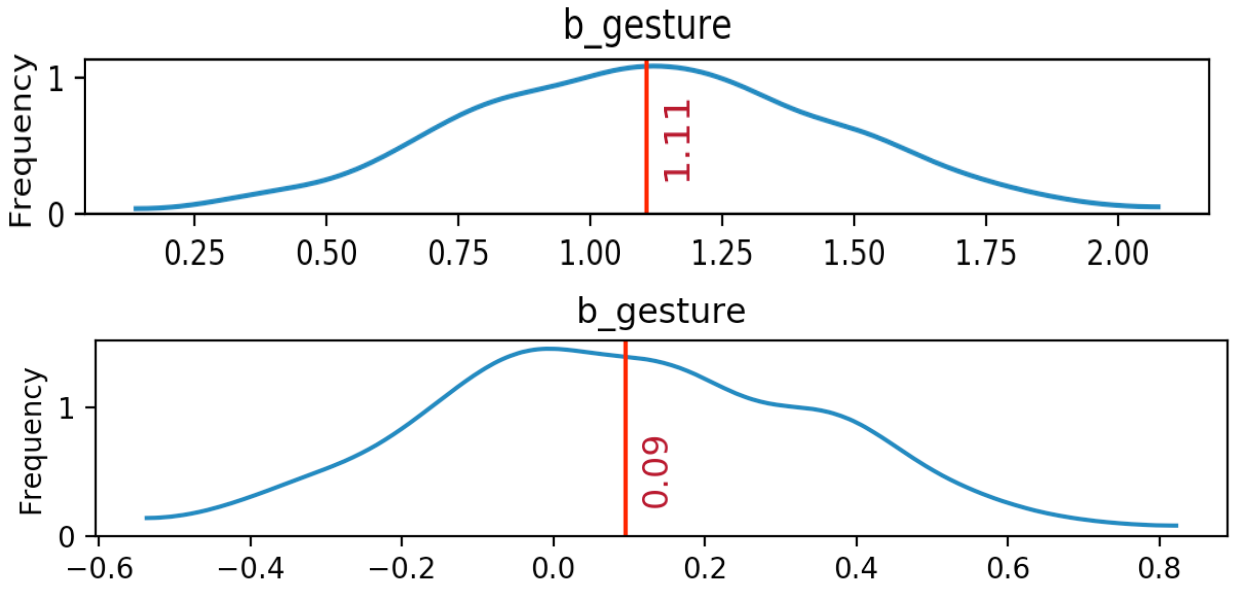



**Figure 16**: Gesture Parameter Comparison of Pretest Result (top) and Final Survey Result (bottom)

From figure 16, we can see the distribution for gesture parameter coefficient in our Bayesian regression model. The distribution on the top is from our pretest, while the bottom one is from our final survey. The coefficient distribution median dropped from 1.11 to 0.09 in our final survey. This shows that the effect caused by gesture in persuasion is not that significant. The result suggests that gesture parameter has a slight positive correlation with persuasion score. From the comparison between result from pretest and final survey, we can also discover that the range of distribution reduced a lot from over 2 to around 1.4 in final survey result. This shows that we have higher confidence level for the result from our final survey.

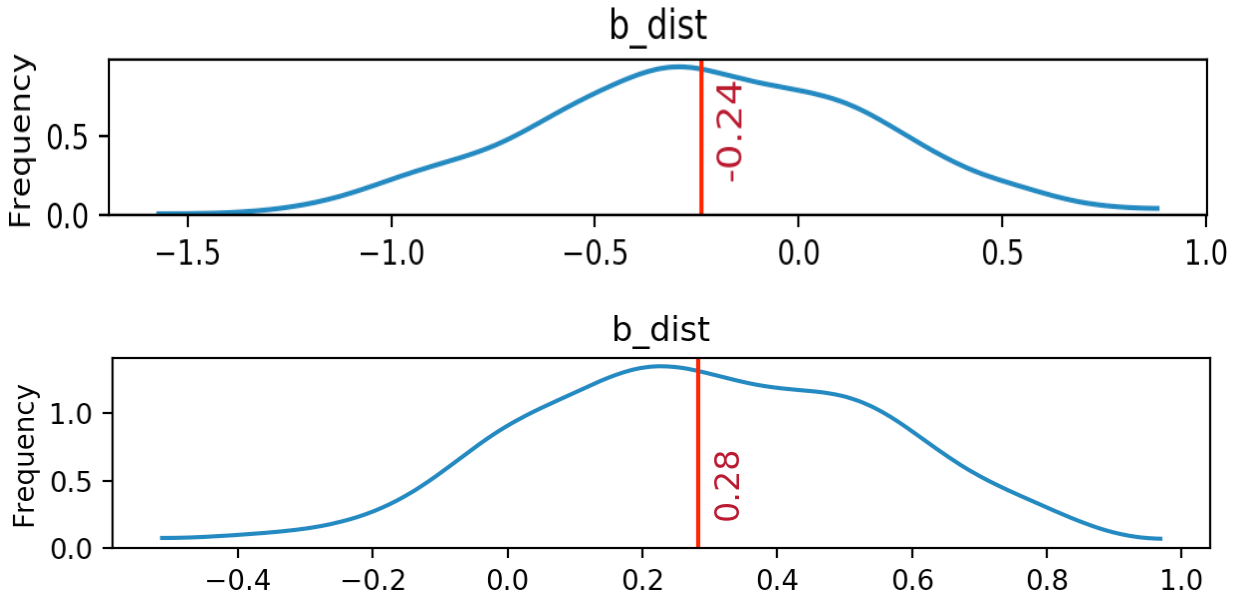



**Figure 17**: Distance Parameter Comparison between Pretest Result (top) and Final Survey Result (bottom)

As for figure 17, we can see the distribution for distance parameter coefficient in our Bayesian regression model. The distribution on the top is from our pretest, while the bottom one is from our final survey. The coefficient distribution median increased from -0.24 to 0.28 in our final survey. Although the outcome from both of our experiments is differing, the result is consistent with our hypothesis. Recall from our pretest, higher distance score means that the two characters are closer to each other, while in our final survey, higher distance score means farther distance between the characters. This means that both of our experiments suggest that farther distance between characters results in higher persuasive scores. The result indicates that distance parameter has a positive correlation with persuasion score. From the comparison between result from pretest and final survey, we can also discover that the range of distribution reduced a lot from over 2.5 to around 1.4 in final survey result. This shows that we have higher confidence level for the result from our final survey.

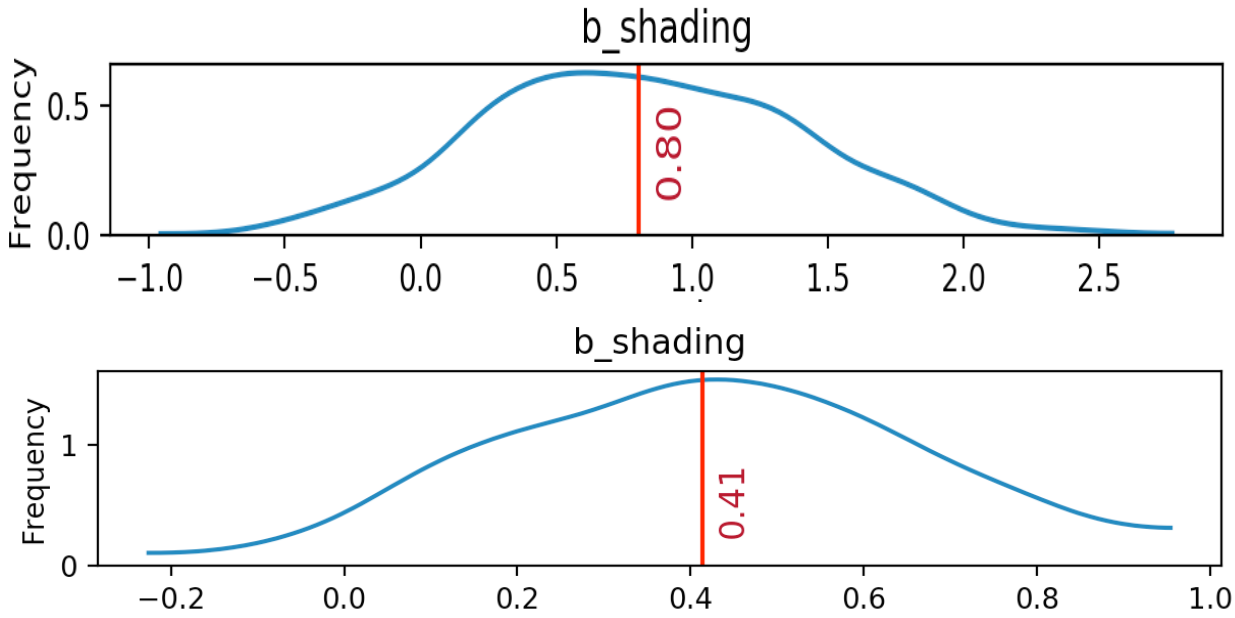



**Figure 18**: Shading Parameter Comparison between Pretest Result (top) and Final Survey Result (bottom)

Finally, from figure 18, we can see the distribution for shading parameter coefficient in our Bayesian regression model. The distribution on the top is from our pretest, while the bottom one is from our final survey. The coefficient distribution median dropped from 0.8 to 0.41 in our final survey. Although the Bayesian coefficient dropped, the outcome stays consistent with our pretest results. This outcome indicates that shading parameter has a positive correlation with persuasion score, meaning that darker shading contributes to the expression of emotion and increases the likelihood of persuading behavioral change. From the comparison between result from pretest and final survey, we can also discover that the range of distribution reduced a lot from over 3.5 to around 1.2 in final survey result. This shows that we have higher confidence level for the result from our final survey.

The overall result from our final survey stays consistent with the pretest result. We showed that all 3 parameters: gestures, distance, and shading all have positive correlation with the persuasive score, with shading being the most effective, followed by distance and gesture. We present this outcome with a higher confidence level and can serve as a foundation for future study in comic persuasiveness.

### 6.3 Combination Effect

Aside from the results for each individual parameter, we also examined the combination effect of multiple parameters in persuading behavior change. The results are shown below.

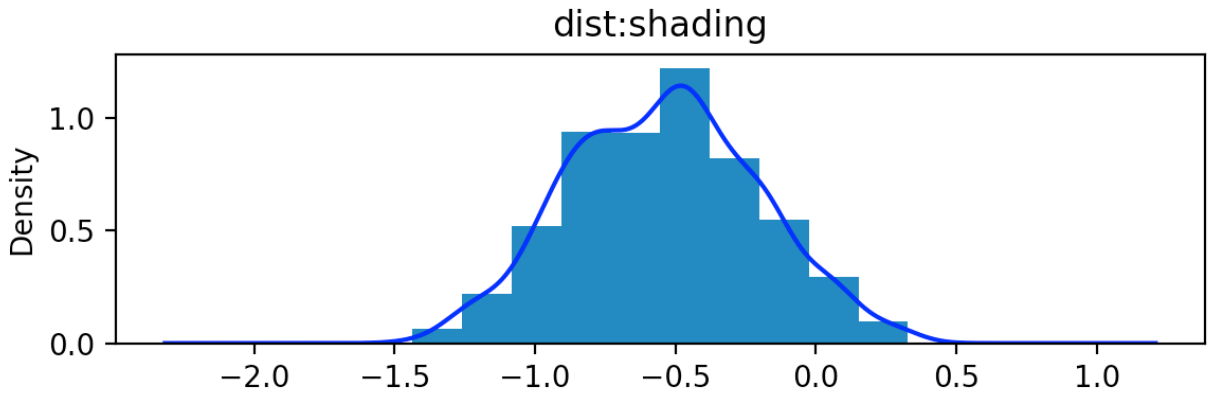



**Figure 19**: Combination Effect Distribution of the Distance and Shading Parameter

From figure 19 above, we can see that the combination effect distribution of distance and shading parameter peaks at around -0.5, with the highest density centered around -1.5 ~ 0.5. This distribution suggests that when both distance measures and shading measures are used, they have a negative combination effect. This means that the persuasion score will increase if shading is increasing and distance is decreasing. Recall from the previous chapter that a decrease in distance parameter means closer distance between characters. With more shading and less distance between characters, persuasive score is higher.

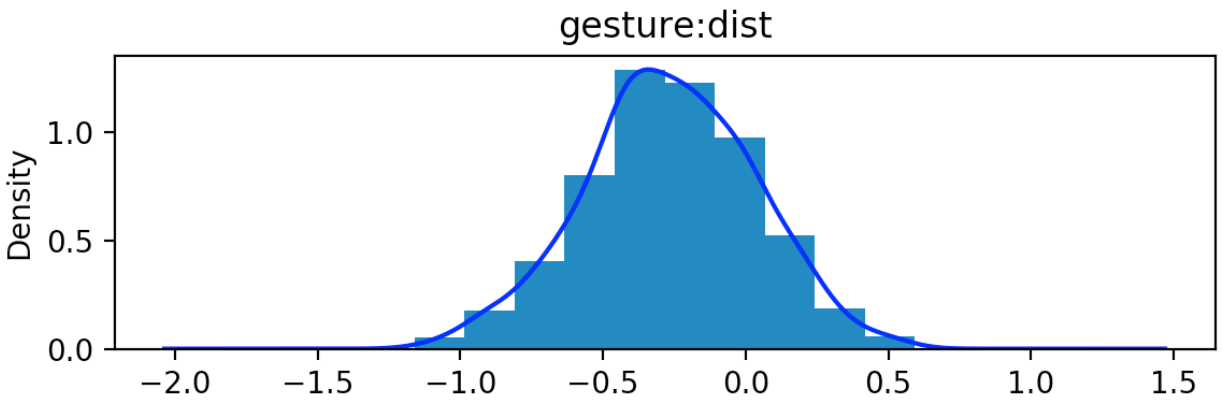



**Figure 20**: Combination Effect Distribution of the Distance and Gesture Parameter

From figure 20 above, we can see that the combination effect distribution of distance and gesture parameter peaks at around -0.4, with the highest density centered around -1.0 ~ 0.5. This distribution suggests that when both distance measures and gesture measures are used, they have a negative combination effect. This means that the persuasion score will increase if gesture is increasing and distance is decreasing. With more gesture and less distance between characters, persuasive score is higher.

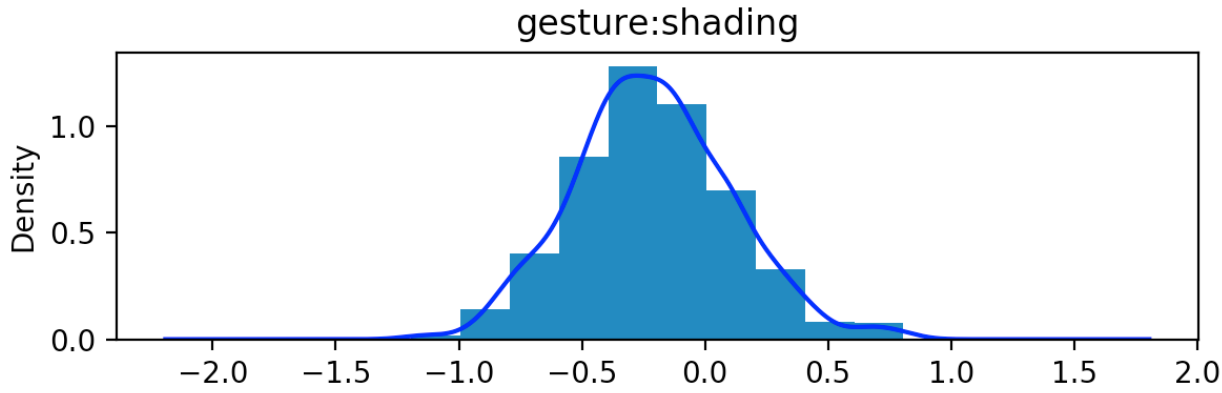



**Figure 21**: Combination Effect Distribution of the Shading and Gesture Parameter

From figure 21 above, we can see that the combination effect distribution of shading and gesture parameter peaks at around -0.4, with the highest density centered around -1.0 ~ 1.0. This distribution suggests that when both shading measures and gesture measures are used, they have a negative combination effect. This means that the persuasion score will increase if shading is

increasing and gesture is decreasing. With more shading and less gesture for the characters, persuasive score is higher. Recall from previous section that gesture parameter has very little effect on persuasive score individually, as a result, when combined with shading parameter, it results in negative combination effect.

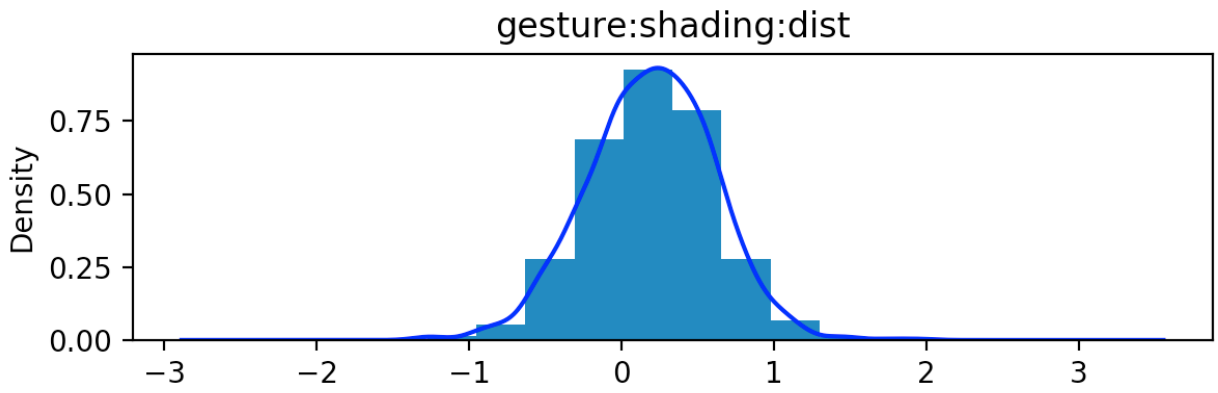



**Figure 22**: Combination Effect Distribution of Shading, Distance and Gesture Parameter

Finally, we also examined the combination effect of all 3 parameters. The result is shown in figure 22. From the distribution, we can see that the combination effect distribution for shading, distance, and gesture parameter peaks at around 0.2, with the highest density centered around -1.0 ~ 1.3. This distribution suggests that when all 3 measures are used, they have a positive combination effect. This means that if we use all 3 parameters, the persuasion score is likely to increase. The distribution not only proves that these comic parameters have an impact on persuasiveness of the message, but also suggests that the message will be more persuasive when combining all 3 parameters.

### 6.4 Participant Feedback

In addition to our comparison questions, we also included one question at the end of our survey to collect participant's opinion on the comic/text design or why they chose comic or text. This feedback for our survey and experiment gives us some insights on how we can interpret the result and improve our design. From the 26 results we got from the final survey, we organized them into 3 main groups of opinion: text-prone, comic-prone, and neutral.

For text-prone participants, most of the reasons for their choice centered around text being more straight-forward. Some participants mentioned that the comic didn't add too much content to the message and was just repeating the text message. It will be better if the comic can have more context and engage the reader. They think that in this case, text will be more straight-forward in conveying the message, thus more persuasive. Some participants also suggest that text seems more formal in communicating ideas of work progress, while comic seems more casual and joking. They think that they will take plain text messages more seriously when compared to comics.

However, on the other hand, comic-prone participants have reflected that comics held their attention better than plain text, making them more engaged to the message comic is trying to communicate. Some other participants mentioned that "comic can represent in one picture what a wall of text might try to unsuccessful convey". They consider comic to be a more convincing form of message because it contains all the context of emotion and gestures that is hard to be mistaken. A reader might interpret a text message differently and consider a negative message as positive. It is harder to feel positive when a comic message has shading and negative emotion.

There is also a group of participants that is neutral without particular preferences and chose the messages based on different reasons. A participant reflected that "The images are more effective most of the times in making the message impactful rather than the textual description. There are only a few cases where the text was better than the image as the language used in the text was more motivating than that in the image. The body language in the images send the message across better than plain text." Another group of participants based their choice on how clear and positive the message is. They think that messages that are too negative are less motivating for them to change their behavior.

In general, most of the participants favor the comic elements and their effect in attracting and convincing readers. Some consider our design to be more persuasive with the additional comic elements, while others think that the content of comic needs to be exaggerated even more to be persuasive. For both of the cases, our design has proved that we can not ignore the fact that comic elements have an impact on the persuasiveness of comic. Further work on different comic elements and the positive/negative tone of the messages to make them more persuasive will be an interesting direction for advance study.

# CHAPTER 7
# FUTURE WORK

Using comic/graphic to convey information is an emerging field in human computer interaction and social networks. In this era of information explosion, designing the message so that it can stand out among other messages and convey the idea to the right group of people is sometimes even more important than the idea itself. Although our study provides promising results to the comparison between the persuading effect of comic and plain text message. There are certain limitations to our study that will be interesting directions for future study.

In our study, we examined the result on the general audience without any specific group selection. From previous studies, we already know that comics are most popular among certain group of people such as students with age between 14~25. One possible future direction for our study might be to examine the effect of comic persuasion for different group of people. Will students have higher acceptance for comic form messages on social network or will male have higher acceptance for comic than female? These are all interesting questions for future study to better understand the persuasive affect of comic on different target group. One thing to notice from our study is that although the general average result reflects that the majority of people prefer comics, there is another group of people that would prefer text and is consistent throughout our survey. The result reflects that there are more people that prefers only comics or only text than people that prefer comics sometime and text sometimes. This illustrates the importance of identifying target groups that will prefer comics over other forms of information and is one interesting direction for future studies.

Our study provides a fundamental result for study in persuasive effect on social network. We proposed a qualitative evaluation method to examine the comparison between comic and text messages by crowdsourcing on Amazon Mechanical Turk. Although qualitative evaluation method through surveys provides promising results for our study, it will be useful to conduct a quantitative evaluation on participant's behavioral change. This will require actual posting of the messages of participant progress on the social network and designing mechanisms to examine participant's behavior change throughout a period of time. The most important part of this additional study is the design of mechanism to continuously keep track of participant's behavior.

This system will not only be used to report progress in order to generate comic/text messages, but also used to evaluate the level of behavioral change throughout time. However, with the data collected, we will be able to quantitatively compare the results for comic and text.

Another interesting direction for future study is to discuss the effect of comic panel sequences. In our study, we only used single panel comics to convey the message to participants on social network. One of the characteristic of comic is that it can engage the reader more compared to plain text. Thus, it will be an interesting study to explore the persuasive effect of comic sequences. In addition to the original parameters set, we need to add an additional parameter of time. From [2], we know that comic sequence can better convey a complete story and engage the readers. Although we can not conclude that the more engaged the reader is to the message, the more likely that he/she will be persuaded and result in behavior change. However, it will be an interesting future study to research on the persuasive effect of comic sequence as compared to single comic panel or plain text.

From our study, we discover that although the majority prefers comics over text on the same message, there is still a little group of participants that prefer the opposite. These participants reflect that there is no additional information conveyed by our comic. The comic elements such as shading and gestures are redundant and confusing for readers. As a result, they preferred the straight-forward text. These are some useful feedback for future improvement of our design. How to produce additional context to the comic using the tags in order to engage readers more is a challenging yet interesting direction for future study and improvement.

# CHAPTER 8
# CONCLUSIONS

In this study, we demonstrated that comic-style posts are more persuasive compared to plain text posts on social network. Previous works have proved that comics can be more attractive, more engaging, and more expressive for emotion when compared with plain text. This work is one of the first to research on the persuasiveness of comic form messages in a social network setting. The reason for this study is because there is more and more information of different form in our daily life, making important messages harder to get to readers. As a result, we presented this work to investigate the persuasive effect of comic form messages.

In order to examine our hypothesis that comic-style post compared to text-based post on social network can better persuade people to adopt behavioral change, we designed a text-to-comic transform system and 2 user studies. In chapter 3, we first implemented a method to automatically generate comic-style messages from text messages. Second, we designed an evaluation to examine the persuasiveness of comic messages by comparing them with plain text. Finally, we conducted a survey on Amazon Mechanical Turk to understand the persuasive effect of different comic elements. We applied Bayesian regression model to the data collected from user study to understand the relation and effect of different comic parameters.

The result from our study supports our main hypothesis that comic form messages are more persuasive than text messages and more likely to motivate participants to adopt behavioral change. From this study, we also discover that the emotion associated with comic has a noticeable impact on the persuasive effect. In the case when comic elements contradict with the emotion of the message, we found that text is more persuasive. On the other hand, when the comic elements are consistent and aligned with the emotion, we found that comic is much more persuasive than text. Finally, in this study, we also compared and evaluated the persuasiveness of several comic parameters. The result from our final survey suggests that shading is the most important factor in comic message persuasion, followed by the distance between the characters and the gestures of the characters.

The findings from our study serve as a foundational basis for future research on comic / graphic message persuasion. Previous research on message framing and phrasing to make text

more persuasive have been dominant throughout the years. However, research on graphic element's persuasive effect have been very limited. Our work demonstrates that comics can not only be an entertaining media, but also a medium to convey attractive and persuasive messages. Despite the promising results from our study, there are certain limitations for the work. First, we conducted the experiment on participants from all demographic group. Specific groups of people might have higher acceptability for comic form messages while others might prefer plain text. Research on identifying the target groups for comic / text messages will be an interesting direction for future study. Another limitation for our study is that the comics designed are limited to single panel. This discarded a lot of different possibilities for comic sequences. Research on comic sequences and its effect in persuading behavior change can have a profound impact on the field of human-computer interaction. Building on the result of our study, future research will be able to advance in the study of comic / graphic messages and applications will be able to utilize comic's characteristics to better communicate ideas.

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